

IEIGOA NEWS

The Institution of Engineers (India)

AN ISO 9001:2008 CERTIFIED ORGANISATION (Estd. 1920, incorporated by Royal Charter 1935)

GOA STATE CENTRE

'98 Years of Relentless Journey Towards Engineering Advancement for Nation Building'

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From the Chairman's Desk

Dear members,

It is my great pleasure to extend the heartiest greetings to the readers of this issue of IEI Goa News. The Institution of Engineers (India) was established in the year 1920. Since then, the Institution has been maintaining its aims and objectives. Currently, the Institution has grown to 29 State Centres and 91 Local Centres, altogether 120 in number.

At present the Institution is headed by the President and the Council Members (99 Nos.) who are elected from amongst the Corporate Members from all the States in India.

It takes a lot of passion, determination & patience to transform ideas into effective solutions - and even more to turn those into products which contribute to your success. It is this passion that has made The Institution of Engineers (India) one of the largest Institutions of professional engineers.

Since the last few decades, our education system has seen a paradigm shift but ever since inception, our intent to invite the outstanding achievers from all backgrounds is still the same. It is a part of our constant endeavor to identify the talent in each student. We are engaged in continuous evaluation, comprehensive curriculum and syllabi based on practical application which has proved to be better learning levels.

The activities of the Institution are equally useful to the Technical as well as non-Technical population in India. Regrettably, the information about our activities is not reaching the general public. The Institution is trying to change the situation by publishing the Journals and the News Bulletins through various State Centres/Local Centres. By publishing selected articles in Engineering, our State Centre is also contributing to this task by publishing this bi-monthly Bulletin which spreads words of our activities around the State as well as the country.

Although, the Newsletter format is limited in the amount of in-depth information it can provide, we make every effort to describe, if only briefly, our achievements and the way forward to achieve the goals and target. We appreciate the criticism, opinion and encouragement in doing so.

With Best Wishes,

Er. Gurunath M Naik Parrikar
9168694667



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BUILD A HOUSE WITHIN 24 HOURS USING 3D CONCRETE PRINTER



Er. Nancy Dias

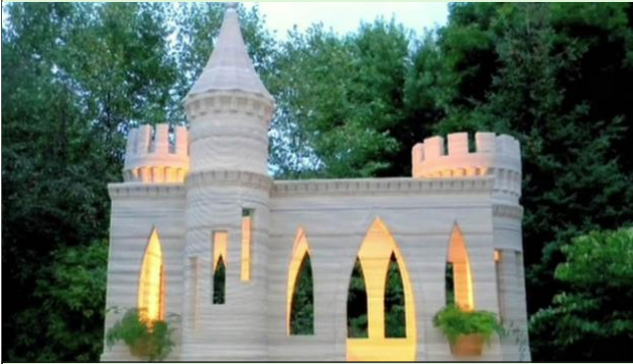
By Er. Nancy Dias, MIE, Lecturer in Civil Engineering, Government Polytechnic Panaji

By using a 3D concrete printer, a San Francisco-based 3D-printing startup, Apis Cor, recently showed it could 3D-print concrete walls for a small house in less than 24 hours costing under Rs.7 lakhs. The printer, which resembles a small crane, places layers of concrete mixture layer by layer. After the walls have been laid, the printer is removed after which the insulation, windows, appliances and a roof is added. Using a 3D-

magnesium based binder is also used to create stone like objects. Experiments are also carried out using Epoxy resins. This technology offers various advantages like faster construction, lower costs, greater accuracy, high quality and accuracy, eco-friendly, less waste, efficient and reliable, increased complexity and high safety standards

Extraterrestrial printed structure

Experiments to construct habitats on Moon and Mars using 3D technology have already started by using 90% of the structure mass consisting of lunar/Martian material and only 10% of the structure mass transported from Earth. These structures would provide both radiation and temperature insulation for the occupants.



Concrete walled house built in 24 hours



Crane laying down concrete, layer by layer

printer to lay down concrete walls on a test site in Russia, the firm was able to "print" a 400 sq. ft. house. The company claims these houses could be used to help quickly re-house people affected by natural disasters, or in areas of extreme housing crises.

3D Printed Mud

This is another groundbreaking project from IAAC, an architectural firm in Barcelona. The institute has found a way to take soil from the ground, combine it with a few additives and turn into a building material with tensile



Prototype getting ready



Tip showing laying of concrete layer

The technology has seen a significant increase in popularity in recent years as many new companies emerged in the market. This has led to several important milestones, such as the six storied, 3D printed office building in Dubai (Winsun, Shanghai) and the 3D printed foot bridge in Spain using D-Shape printer (Monolith, UK). Winsun uses a 3D printer which prints using a special ink made up of cement, sand, fiber, along with additives. This company also uses of demolition waste or mine tailings for its ink and produces zero waste. Sand, seawater and

strength three times higher than industrial clay. This technology can be set up in the poorest countries in the world and build schools, houses and even hospitals.

The construction industry is overjoyed with the benefits and eco-friendliness of 3D printing and it is envisaged that it will not be too long that each and every structure on earth would be 3D printed.

WORKSHOP ON NEURO LINGUISTIC PROGRAMMING (NLP): A REPORT

The Institution of Engineers (India) Goa State Centre has organized the workshop on '**Neuro Linguistic Programming**' in association with International Centre Goa at Dona Paula, Goa on 17th February 2018. The Trainers for the workshop were Mr. Suren Kolkankar and Mr. Rajeev Fadte.

Er. Dilip Sahakari, Convener of the workshop welcomed the participants from different fields such as Corporate, Consultants, Engineers, Chartered Accountants, Govt. Officials and retired personnel. In his introductory speech

which tends to be stronger than the logical conscious mind and as habits / patterns are generated and stored by the unconscious mind, the change needs to occur at the unconscious level. Unwanted behaviours and beliefs have been learned and stored at an unconscious level, and these may no longer serve one. It becomes an automatic unconscious response which is unable to change



Er. Dilip Sahakari welcoming the audience



Mr Suren Kolkankar & Mr Rajiv Phadte demonstrating the concept & Application of NLP to the participants.



he explained the roles and functions of The Institution of Engineers (India).



Reply to queries by Mr S. Kolkankar & Mr R. Phadte

Mr. Rajeev Phadte demonstrated the importance of NLP for people in personal, professional and social life and the way goals can be achieved. Mr. Suren Kolkankar also explained the negative emotions and limiting behaviours

consciously, this is the same for phobias and fears and they can only be changed at the unconscious level, and this made the NLP famous for fast phobia cure. The replies to the questions raised by the participants were given by Mr. Suren Kolkankar & Mr. Rajeev Phadte.

The IEI Goa News, Bimonthly magazine of The IEI Goa State Centre has been also released by Mr. Suren Kolkankar, in presence Er. Gurunath M. Naik Parrikar, Chairman, IEI Goa State Centre and Er. Deepak A. Karmalkar, Hon. Secretary, IEI Goa State Centre & Editor of IEI Goa News. Around 40 participants were present for the workshop.

The Vote of Thanks was conveyed by the compere and Convenor of the programme, Er. Dilip Sahakari.

TRANSPARENT SMART PHONES, A REALITY?



The scientists at the Korean Advanced Institute of Science and Technology, Jung Won Seo, Jae-Woo Park, Keong Su Lim, Ji-Hwan Yang and Sang Jung Kang, have invented the world's first transparent computer chip. The chip, known as Transparent Resistive Random

Access Memory (TRRAM), is similar to existing chips known as (CMOS) or metal-oxide semiconductor memory. The TRRAM is completely clear and transparent whereas the others are not. "By integrating TRRAM with other transparent electronic components, we can create a total see-through embedded electronic systems." With this technology the glass in windows or mirrors or table top would be able to be used as computer monitors and television screens. "It is a new milestone of transparent electronic systems," says Jung Won Seo. This new electronics technology is expected to be available within 3 to 4 years.

ACOUSTIC CONSIDERATIONS IN CARS

By Er. Sunil T. Shetye, H.o.D.
(Mechanical Engg.), G. P. P.

M.E. (Mechanical Engineering
with Automobile Subjects)



Er. Sunil Shetye

NOISE & VIBRATION CONTROL IN CARS

ACOUSTICS: Firstly, it must be understood that acoustics is a complex science. Acoustics is the quality that determines the ability of an enclosure to reflect sound waves effectively and produce clear hearing. Important areas to consider are STC ratings of materials used in the construction of the roads, the car, absorption of sound generated within the space and the NC rating.

Factors Involved In Car Acoustics

Road Noise: Other cars on the Road, Wind, Rain etc.

Vibrations: rattling of the cars body, interiors and exteriors of the car

Electrical & Electronic interference

Size/shape of Cabin: dead space and echoes

Materials used: for interior and Exterior of cars

Factors to Improve Your Car's Acoustics

Elimination of environmental noise- the road is noisy with wind, tires, and other cars on the road. To eliminate the background noise: Buy new tires, Tune the engine, Replace the muffler, Tighten loose bolts and hinges for less rattle and Specifically position the speaker

Speaker Positioning

1. Equidistant and unobstructed from the listener
2. Achieving time alignment- you want sound to arrive simultaneously to the ear.
3. Mount the speakers in the upper portion of the doors or bottom of the doors with correct angle
4. Rear speakers should be aimed at the listener, not the glass
5. Use a UTP (unshielded twisted pair cable) to separate the electrical wires and speaker wires.

Best Type of Cars for Acoustics:

Hatchbacks and SUV's

Worst Cars for Acoustics:

Soft Top Cars: Softer materials absorb the sound and the bass will not be able to effectively reflect. The seat material plays into the absorption of sound as well.

Convertibles: The convertible is similar to an outdoor auditorium, as the top will allow the noise to escape without reverberation.

Cab Trucks: The cab truck has limited space so the subwoofers lay directly behind you.

Car Configurations: Cars with the stereo located in the back makes it difficult to hear.

Cars with the gas tank directly behind the rear seat pose problems for it makes it difficult to run wires through those types of cars. Old cars with large trunks and solid backseats pose difficulties since it is hard to get the sound to travel through the thick seats.

Products Used to Better Your Car's Acoustics:

1. "Slim" Subs- these subs are $\frac{1}{2}$ the mounting depth, which makes it easy to apply to cars with limited space.
2. "Acoustic Interlayer"- this layer goes behind some of the newer windshields. Noise is transmitted through the vehicle's glass in four main ways:
3. Air-pressure differences can be heard against the glass at highway speeds.
4. Air hitting the edges of the vehicle's body
5. Outside traffic and environmental noise

Vibration of the car

1. Thickening the glass provides some noise reduction and adds weight to the vehicle for less rattle. The interlayer dampens unwanted sound and is particularly efficient in the 1,500 Hz to 5,000 Hz range. It can reduce the sound by 2-3dBs overall.
2. Imprint Sound Processors: This new sound technology mends acoustic problems in the car's cabin. It measures your car's acoustics, processes the sound, and then delivers the optimal sound based on your cars measurements
3. "Hush up"- this product is applied to floors, doors, or whole interiors to dampen vibrations, squeaks rattles and road noise.
4. "Hardtop Acoustic Sound Deadener"- reduces the noise inside your hardtop with a custom designed install.

Some Technical details about Sound Accoustics:-

Human hearing range: 20 Hz to 20,000 Hz.

Corresponding wave length 15 mm to 15 m

Velocity, c m/s

Frequency, f a number

Wavelength, λ m

Velocities:

In gases / air $\sim 330 \text{ ms}^{-1}$

In liquids $\sim 2000 \text{ ms}^{-1}$

In solids $\sim 5000 \text{ ms}^{-1}$

Now since $c = f\lambda$, wavelength varies with Medium

NC RATING: Noise Criteria (NC) is a basic measurement of how quiet the space where the automobile is operating, All of the considerations mentioned above work together to affect the NC rating of a space. An NC rating of 35 dbA or less is ideal. Higher levels will begin to work against speech intelligibility. It is important to note that audio-visual electronic equipment installed in the car can have major effect on the NC rating. AC systems can sometimes introduce fan noise that raises the NC rating several db, as do cooling fans on other electronic gear that might be installed in the car.

Zone Criteria for Implementation

Residential: 55 dbA (10 dbA reduction for night)

Commercial: 57 dbA

Industrial: 60 dbA

(..Contd on page 7)

CHARGE YOUR SMART PHONE, NO ELECTRICITY REQUIRED

The study carried out at the University of Buffalo and Institute of Semiconductors (IoP) at Chinese Academy of Science (CAS) describes a small tab 1.5 centimeters long, by 1 centimeter wide delivering a maximum voltage of 124 volts, a maximum current of 10 microamps and a maximum power density of 0.22 milliwatts per square centimeter which lit 48 red LED lights simultaneously.

"The human body is an abundant source of energy. We thought: 'Why not harness it to produce our own power?'" says lead author Qiaoqiang Gan, PhD, associate professor of electrical engineering in UB's School of Engineering and Applied Sciences. Co-authors of the study include Huamin Chen at IoP and CAS; and Nan Zhang, a PhD student at UB.

It is a known fact that certain materials become electrically charged after coming into contact with a different materials. This is called Triboelectric charging. Most everyday static electricity is triboelectric in nature. Presently, numerous nanogenerators that utilize the triboelectric effect have been proposed but most of them are difficult to manufacture or are not cost effective. This

newly developed tab addresses both the concerns.

The newly manufactured tab consists of two thin layers of gold, having PDMS i.e. polydimethylsiloxane, which is a silicon-based polymer used in contact lenses, Silly Putty and other products, sandwiched in between. The process is that after one layer of gold is stretched, it causes to crumple upon release and create a structure similar to a miniature mountain range. On re-application of that force, i.e. from a finger bending, the resulting motion leads to friction between the gold layers and PDMS. "This causes electrons to flow back and forth between the gold layers. The more friction, the greater the amount of power is produced," says another lead author, Yun Xu, PhD, professor of IoP at CAS.



The wearable tab, 1.5cm long by 1cm wide, which lit 48 red LED lights simultaneously

The maximum voltage produced of 124 volts, is certainly not enough to quickly charge a Smartphone, but the researchers plan to use larger pieces of gold, which when stretched and folded together would deliver more electricity. Plans are on to develop a portable battery to store energy produced by this tab.

Very soon, the system could serve as a power source for various wearable and self-powered electronic devices.

Source: University at Buffalo.



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AN ULTRA-THIN DOUBLE-CURVED CONCRETE ROOF



Er. Austin

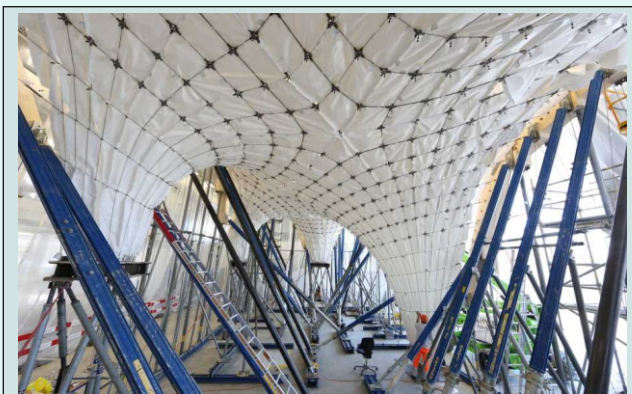
By Austin S. Rodrigues

A 25-foot-tall prototype for an ultra-thin, lightweight, and double-curved, concrete roof, to be used in a residential construction project next year has been created by a group of researchers from ETH Zurich's Institute of Technology in Architecture, led by associate professor Philippe Block, senior researcher Tom Van Mele, and international architecture firm Supermoeuvre. It has an average thickness of about 3 - 4cm, varying from about 3cm thick on the edges to 12cm-thick at the roof's support areas. The roof is self-supporting structure which is a double-curved concrete shell having several layers of heating and cooling coils, and insulation sandwiched between two concrete layers. Reduction in concrete

concrete. The cable net weighs just about half a kilo and the textile about 300 grams which is enough to support green concrete weighing about 20 tons. Holcim Switzerland provided expertise to determine the correct concrete mix design and spraying procedure. The mix had to be fluid enough to be sprayed and vibrated but viscous enough to not flow off the textile especially in vertical parts. Together with Bürgin Creations and Marti the concrete was sprayed using a method which was specifically developed to be able to spray the material onto the textile with limited pressure. The prototype was completed in 6 months, but the actual building construction is expected to be completed within 8 to 10 weeks.



Ultra thin light weight concrete prototype



Steel cable net scaffolding - polymer textile formwork

usage helps not only to save a lot of weight and material but also brings about reduction in a lot of carbon dioxide generated and grey energy in a concrete structure. Also, the exterior layer of the concrete could be lined with thin-film photovoltaic cells to generate energy for the building.

A net of steel cables is stretched to form a reusable scaffolding structure and is supported by a polymer textile that together function as the formwork for the

The foundation provided to such superstructure is annular type. All factors such as wind loads, snow loads, earthquake movement, and any other factors that affect the design are considered. The ring beam foundation is designed to take care of loads and to transfer them to the soil. A step is formed on the ring beam where an air form gets attached. At times, at this point an optional vertical stem wall made of RCC, PSC (pre-stressed concrete) or insulated concrete forms is built with an additional ring beam located at the top of this wall. This upper ring beam is especially designed to resolve any non-vertical loads. Therefore, the vertical loads get applied to the top of the wall and are transferred down to the foundation.

Concrete ultra thin-shells can be built for schools, housing, storage, auditoriums, worship facilities, and other large free span structures. The advantages to this structure are strength, durability, energy efficiency, and relatively low cost. These shells possess good amount of inherent strength due to which these structures can withstand exceptional loads caused by natural hazards. The natural shape of the structure provides back-up through multiple load paths. Therefore, even if there is a localized failure, the building envelope is found to be maintaining an adequate safety level.

Source: Ned Cramer Magazine

10 equals 9.999999...

Can you point out the error in the proof?

Proof:

Let $x = 9.999999...$ -----> Equation 1

Multiplying 10 on both the sides,

$10x = 99.999999...$ -----> Equation 2

Subtracting Eqn 1 from Eqn 2,

$10x - x = 99.999999... - 9.999999...$

$9x = 90$

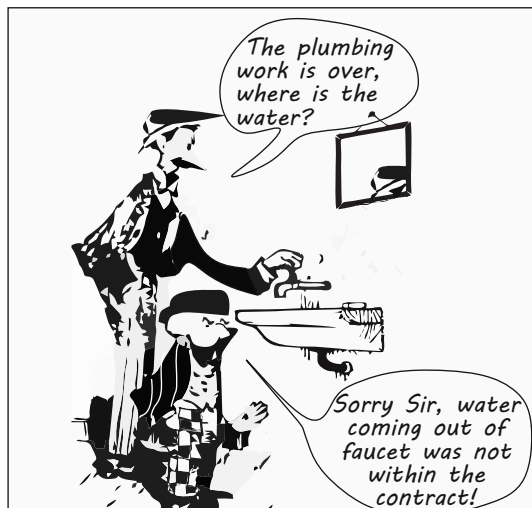
$x = 10$

In this proof above, one can see how 10 is equal to 9.999999... .

Is this proof correct?

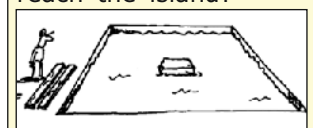
Does 10 equals 9.999999... for real or there is some error in the proof? Can you guess? (Answer on page 8)

LIGHTER ZONE



BRAIN TEASER

Nitin wants to reach an island which is in the middle of the river. The island is 20 metres from the edge of the river on all sides. As shown in the picture below, he got only two wooden planks about 19 metres long each. How can Nitin reach the island?



(Answer on page 8)

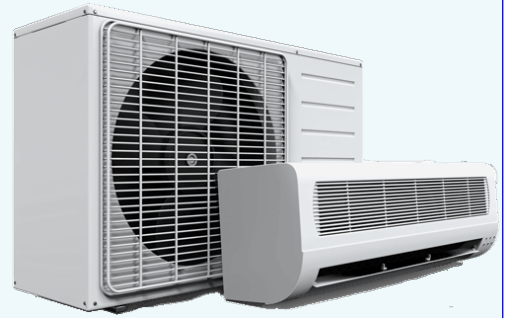
AIR CONDITIONERS TO RUN ON SUN'S HEAT

It is well known that thermoelectric devices are made from materials which can convert a temperature difference into electricity, without requiring any moving parts. Also, it works too in a reverse fashion i.e. if electricity is applied to a thermoelectric device, it can produce a temperature difference. The thermoelectric devices are presently used for relatively low-power applications, such as powering small sensors, backing up batteries, etc.

When a thermoelectric material is subjected to a temperature gradient i.e. one end is heated, while the other is cooled then electrons in that material start to flow from the hot end to the cold end, generating an electric current. Also, the larger the temperature difference, the more is the electric current produced, and thus more power generated. The magnitude of energy that can be produced depends on the particular transportation properties of the electrons in a given material.

Research is on to design more powerful thermoelectric devices which would produce electric current from heat generated as a byproduct of industrial processes and combustion engines. Liu, the first author of the *PNAS* paper, which includes graduate students Jiawei Zhou, Zhiwei Ding, and Qichen Song; Mingda Li, assistant professor in the Department of Nuclear Science and Engineering; former graduate student Bolin Liao, now an assistant professor at the University of California at Santa Barbara; Liang Fu, the Biedenharn Associate Professor of Physics; and Gang Chen, the Soderberg Professor and head of the Department of Mechanical Engineering claim that the efficiency of these devices though limited can be increased multifold. The researchers at MIT, have discovered the 'topological' materials, which have unique electronic properties.

"We've found we can push the boundaries of this nanostructured material in a way that makes topological materials a good thermoelectric material, more so than conventional semiconductors like silicon," says Te-Huan Liu, a postdoc in MIT's Department of Mechanical Engineering. "In the end, this could be a clean-energy way to help us use a heat source to generate electricity, which will lessen our release of carbon dioxide." This has been published in a paper in the *Proceedings of the National Academy of Sciences*, wherein the MIT researchers identify the underlying property that makes certain topological materials a potentially more efficient thermoelectric material, compared to existing devices.



While past work has suggested that topological materials may serve as efficient thermoelectric systems, there has been little understanding as to how electrons in such topological materials would travel in response to temperature differences in order to produce a thermoelectric effect. "Tin telluride is just one example of many topological materials that have yet to be explored. If researchers can determine the ideal grain size for each of these materials", Liu says "topological materials may soon be a viable, more efficient alternative to producing clean energy".

This research was supported in part by the Solid-State Solar Thermal Energy Conversion Center, an Energy Frontier Research Center of U.S. Department of Energy; and the Defense Advanced Research Projects Agency (DARPA)..

FORTHCOMING EVENT

The Institution of Engineers (India)

Goa State Centre

One Day Workshop on

'ASPECTS OF NON DESTRUCTIVE TESTING'

Convenor: Er. Balkrishna M. Chodankar, MIE, Contact.: +919822483951

Resource Persons: **Er. Subhash Bandodkar**, Zuari Agro Chemicals Ltd. and

Er. Pritesh Chodankar, Indo Veritas Inspection and NDT Training & Services

on 28th March 2018, at Goa Science Centre, Miramar, Goa



(..Contd from page 8)

ACOUSTIC CONSIDERATIONS

SUMMARY

A properly designed Car will take into account factors that can detrimentally affect acoustic properties. By designing surfaces and barriers that have higher NC ratings, by installing sound absorbing materials on walls, floors and ceilings and by paying careful attention to locating HVAC and other mechanical systems, a designer can achieve a Car design that provides an acoustically pleasant environment.

Some Observations after Experimenting :

1. Driving at 70Kmph with windows up and air conditioner the sound was 99.7db
2. Driving with the windows half down at 70Kmph it was 115db
3. Driving with the windows fully down at 70Kmph 135.2 db.
4. Driving at 30Kmph it was essentially the same

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Answer to 10 equals 9.999999... on page 6

The proof is absolutely correct and has no error.

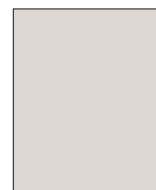
Answer to Brain Teaser on page 6

Nitin simply placed the two planks as shown in the adjoining figure!



We request our members to get more interactive with the Institution. We'd love to have your contributions towards our bulletin, too. Do send in your articles, reports and other information that you'd like to share with other members to our office:
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